

REMARKS

This Amendment is filed in response to the Second Office Action dated December 19, 2006, which has a shortened statutory period set to expire March 19, 2007.

Allowable Subject Matter

Applicant greatly appreciates the Examiner's indication of allowable subject matter. Specifically, Claims 3, 4, 9, and 10 are objected to as being dependent on a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicant has rewritten Claims 3, 4, 9, and 10 in independent form. Therefore, Applicant respectfully requests reconsideration and withdrawal of the rejection of Claims 3, 4, 9, and 10.

Claims 1, 2, 5-8, 11-36 Are Patentable Over Medvedeva

Invention Overview:

As taught by Applicant in paragraphs 0012 and 0013 of the Specification (emphasis added):

[0012] Optical proximity correction (OPC) is a technique of modifying features in a mask layout. These modified features, when exposed during lithography, should form printed features as close as possible to the original layout (i.e. the desired) features. Unfortunately, conventional OPC is performed on unrealistic targets, i.e. 90-degree corners in the mask layout, thereby resulting in excessively aggressive correction in the vicinity of two-dimensional (2D) features. Two-dimensional features can include line ends, outside corners, inside corners, slots, and jogs. These over-corrections can result in pinching (i.e. a line that is too thin) and/or bridging (i.e. adjacent lines being connected) on the wafer.

[0013] In accordance with one aspect of the invention, a more realistic OPC target can be provided, thereby optimizing subsequent OPC and minimizing over-correction. To generate this OPC target, an aerial image can be sampled and its gradient computed at predetermined points on the 2D features. The aerial image advantageously includes spatial information about the local pattern and the interaction of the pattern with the manufacturing process. This information can be used to predict a feasible shape (i.e. curvature) for the 2D feature. The predicted shape can then be used to re-target the edges of the 2D feature based on realistic process capabilities.

Medvedeva vs. Present Invention

Applicant respectfully submits that although Medvedeva and the present invention use some of the same standard process modeling and correction tools to work with a semiconductor pattern, Medvedeva and the present invention are completely different in their implementation and intent. Specifically, Medvedeva uses segments and the aerial image gradient to correct the semiconductor pattern. The purpose of this correction is to produce a photoresist image on the wafer that is the same (or as close to the same as the bandwidth of the manufacturing process will allow) as the pattern drawn by the design engineer.

In contrast, in the present invention, the input pattern is advantageously changed to a physically-realizable shape prior to optical proximity correction (OPC). In other words, the shape on the wafer will be purposefully and deliberately changed from what the design engineer has drawn. Thus, when the pattern is corrected using OPC (as taught in Medvedeva or using another OPC technique), the pattern shape produced on the wafer will be the new pattern generated by the algorithm in the present invention. Therefore, the present invention is performed prior to the point in the tape out and OPC flow at which Medvedeva begins to work with the pattern.

Remarks:

Claim 1, as amended, now recites in part:

determining a normal **target** shift for the two-dimensional segment based on the aerial image gradient at the evaluation point, wherein determining the normal **target** shift for the two-dimensional segment includes determining a measured aerial image magnitude and at least one of a measured angle of the aerial image gradient, a plurality of empirically-derived fit constants, a base angle where no shift is applied, and a base magnitude where no shift is applied; ...

saving the modified **target** position as part of the interpreted pattern, **wherein the modified target position provides a more realistic optical proximity correction target.**

Applicant respectfully submits that Medvedeva fails to disclose or suggest these limitations. **Specifically, as described above, the recited steps of Claim 1 are performed prior to OPC, which is taught by Medvedeva.**

Moreover, Medvedeva teaches making mask (not layout) corrections by (a) providing parameter initial values, (b) performing coherent field calculation, (c) performing process intensity calculation, and (d) calculating a cost function. Col. 3, lines 1-5. Calculating the cost function includes using cutlines C_{out}^0 and C_{in}^0 of a process intensity, which characterize an intensity gradient near an aerial image contour. Col. 3, lines 25-27. These cutlines, at most, teach a magnitude.

Notably, Medvedeva fails to teach the recited step of determining the normal **target** shift, which further includes determining at least one of a measured angle of the aerial image gradient, a plurality of empirically-derived fit constants, a base angle where no shift is applied, and a base magnitude where no shift is applied.

Based on the above reasons, Applicant respectfully requests reconsideration and withdrawal of the rejection of Claim 1.

Claims 2, 5, and 6 depend from Claim 1 and therefore are patentable for at least the reasons presented for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 2, 5, and 6.

Claim 7, as amended, now recites in part:

determining a normal **target** shift for the two-dimensional segment based on influence, wherein determining the normal **target** shift for the two-dimensional segment includes determining a measured aerial image magnitude and at least one of a measured angle of the aerial image gradient, a plurality of empirically-derived fit constants, a base angle where no shift is applied, and a base magnitude where no shift is applied; ... and

saving the modified **target** position as part of the interpreted pattern, **wherein the modified target position provides a more realistic optical proximity correction target.**

Therefore, Claim 7 is patentable for substantially the same reasons presented for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claim 7.

Claims 8 and 11-12 depend from Claim 7 and therefore are patentable for at least the reasons presented for Claim 7. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 8 and 11-12.

Claim 13, as amended, recites in part,

performing interpretation filtering to generate an interpreted pattern for at least one feature, **the interpreted pattern providing a realistic optical proximity correction target**, the interpretation filtering including computing an aerial image gradient, determining a magnitude of the aerial image

gradient, and determining at least one of an angle of the aerial image gradient, a plurality of empirically-derived fit constants, a base angle where no shift is applied, and a base magnitude where no shift is applied.

Therefore, Claim 13 is patentable for substantially the same reasons presented for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claim 13.

Claims 14-26 depend from Claim 13 and therefore are patentable for at least the reasons presented for Claim 13. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 14-26.

Claim 27, as amended, recites in part,

instructions for performing interpretation filtering, the interpretation filtering generating an interpreted pattern for at least one feature, **the interpreted pattern providing a realistic optical proximity correction target**, the interpretation filtering including computing an aerial image gradient, determining a magnitude of the aerial image gradient, and determining at least one of an angle of the aerial image gradient, a plurality of empirically-derived fit constants, a base angle where no shift is applied, and a base magnitude where no shift is applied.

Therefore, Claim 27 is patentable for substantially the same reasons presented for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claim 27.

Claims 28-34 depend from Claim 27 and therefore are patentable for at least the reasons presented for Claim 27.

Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 28-34.

Claim 35, as amended, recites in part:

determining a normal **target** shift for the two-dimensional segment based on the aerial image gradient at the evaluation point, wherein determining the normal **target** shift for the two-dimensional segment includes determining a measured aerial image magnitude and at least one of a measured angle of the aerial image gradient, a plurality of empirically-derived fit constants, a base angle where no shift is applied, and a base magnitude where no shift is applied; ... and
saving the modified **target** position as part of the interpreted pattern, **wherein the modified target position provides a more realistic optical proximity correction target.**

Therefore, Claim 35 is patentable for the same reasons presented for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claim 35.

Claim 36 depends from Claim 35 and therefore is patentable for at least the reasons presented for Claim 35. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claim 36.

Claims 27-34 Are Directed To Statutory Subject Matter

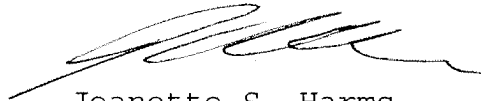
Claim 27, as amended to conform with the Examiner's suggestion, recites, "wherein the computer-implemented program is stored on a computer-readable medium". Based on this amendment, Applicant submits that Claim 27 and its dependent claims, i.e. Claims 28-34, are directed to statutory subject matter. Therefore, Applicant requests reconsideration and withdrawal of the rejection of Claims 27-34.

CONCLUSION

Claims 1-36 are pending in the present application.
Allowance of these claims is respectfully requested.

If there are any questions, please telephone the
undersigned at 408-451-5907 to expedite prosecution of this
case.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Jeanette S. Harms', written over a horizontal line.

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